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ABSTRACT

Sentence patterns are often crucial to the degree of understanding a child derives from the printed page, and if he is to fully understand what he reads, he must be able to analyze the written language patterns in which the information is conveyed. This study analyzed selected passages from three grade 4 basal reader series to determine which transformational generative rules were used in the derivation of the sentences. Reading comprehension was tested by means of cloze tests. Transformations were grouped into five categories--embedding, conjoining, deletion, simple, and position shift. Findings indicated (1) that there is a high degree of similarity between the occurrence of different types of transformations in each of the three series and among the types of transformations that were most difficult across grade levels; (2) written language was generally more difficult when embedding and deletion transformations were present; (3) the difficulty of the majority of transformations (except deletion) correlated significantly with the difficulty of the sentence and passage; (4) the number of transformations per sentence was not a good indicator of sentence difficulty except for those added in the middle of the story; and (5) significant differences occurred when students were grouped by sex. Pedagogical implications are then considered. (HS)

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THE RELATIONSHIP BETWEEN READING DIFFICULTY AND THE NUMBER AND TYPE OF SENTENCE TRANSFORMATIONS.

Outstanding Dissertation Presentation
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Although the communication process makes use of a wide range of media, verbal language is still the basis of the communication act. Very early in life a child (unless afflicted with a severe mental or physical defect) acquires a facility in the use of oral language. One cannot assume, however, that the child's facility with oral language will readily transfer to the language of print. There are differences between oral and written language which often make such transfer difficult. The complexity of written language is still far from being understood.

CS 000 310

THE PROBLEM

Teaching a child to read involves considerably more than the skill of associating sound and symbol. Information, ideas, and concepts are conveyed in print which consist not only of symbols, but symbols in various arrangements and patterns (sentences). These sentence patterns are often crucial to the degree of understanding which a child derives from the printed page and if a child is to fully understand what he reads, he must be able to analyse the written language patterns in which the information is conveyed.

Bormuth (1966) has stated that "... many adults and children fail to understand what they read, not because the concepts are too difficult or because they lack the basic reading skills, but simply because of the complexity of the language in which these concepts are presented (p.81)."

Deciding what structures to teach children to analyse is a problem since little is known about the types of structures to which children are exposed. Certainly, considerable work has been done on the analysis of written language. The readability studies from Vogel and Washburn, who published the first readability formula in 1928 to the Devereux Formula of 1961 (Smith, 1961) tended to focus on a counting of elements - particularly the number of hard words in a passage and the length of the sentence in words. Work of another nature in language analysis has been carried out by such researchers as Strickland (1962), and Ruddell (1963). This group of researchers looked at the complexity of language structure in terms of the similarity between oral and written language structures.

None of the above researchers, however, based their language analysis on a theory of language. Rather they tended to inventory or

categorize elements of various kinds, which, they hypothesized, contributed to written language complexity.

Chomsky's theory of transformational-generative grammar appears to be the most powerful theory of language so far produced which explains how an individual can speak and understand sentences. This language model with its surface and deep structure levels connected by means of grammatical transformations and with its deep structure considered to be the input for semantic interpretation appears to have many implications for reading comprehension. Very little research to test this theory (in terms of reading comprehension) has been carried out.

PURPOSE OF THE STUDY

The writer analysed selected passages from three grade four basal reader series to determine which transformation rules (within the framework of transformational-generative grammar) were used in the derivation of the sentences. The degree to which the number of such transformations per sentence and the types of such transformations affect the degree of comprehension which pupils at the grade four, five and six levels derive from these sentences and passages was determined. Passages were constructed so that the number and type of transformations could be controlled. Reading comprehension of all passages was tested by means of "cloze" tests.

DEFINITIONS

Cloze procedure or technique is the deletion of words in a passage by some objectively specifiable process. In this study every fifth

word was deleted and five forms of each passage were made (that is, form one had words 1, 6, 11, etc. deleted, and form two had words 2, 7, 12, etc. deleted and so on) so that eventually every word was deleted.

Understanding or reading difficulty refers to the child's ability to complete "cloze" tests constructed on passages read by inserting into the blanks in a printed passage the words which had been deleted.

Three methods were used in scoring. The first consisted of scoring for those words which were identical to or grammatically and semantically synonymous with the words deleted (I, GS). Number two method consisted of the same procedures as the first method, plus accepting these words which were grammatically similar to the words deleted (G). The scores from this method were used to derive difficulty indexes for the transforms since the latter were considered syntactical units. The third method of scoring was adopted on the basis of the results of the pilot study where it was found that a number of pupils substituted a word which was not grammatically similar to the word deleted but was grammatically acceptable within the context of the sentence or passage (-GS, -G). The first method was used to get reliability measures for the other two methods. All correlation coefficients were above 0.90.

Word Difficulty is determined by the proportion of subjects who inserted in to the blanks words of a I, GS, or G, nature.

Sentence Difficulty is the average of the difficulties of words within a sentence.

Passage difficulty is the average of the difficulties of words within a passage.

Number of Transformations refers to the number of transformation rules that had been applied in the derivation of a sentence.

Type of transformation is defined for the purposes of this study as the stimulus (i.e. words in orthographic form) to which pupils were exposed. Type of transformation refers to those categories and the particular arrangement in which they appeared in the surface structure which had been the result of the application of some transformational rule to the deep structure. Since this study deals with sentences as they appeared in texts, the categories were filled with lexical items. For example, in the following P-markers the application of the Adjective (by deletion and obligatory placement transformation rule) resulted in "shallow" being brought into the surface structure of the PP as "in the shallow stream". The transformation type was named by the rule which had been applied. Thus "shallow" was a transformation of the type Adjective (by deletion and obligatory placement). See Figure 1 for the deep and surface structure representations of the application of this transformation.

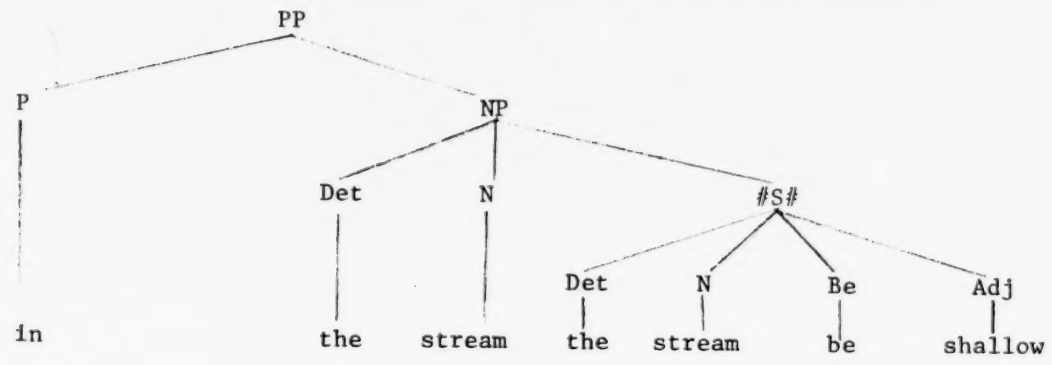
Type of transformation difficulty was the average of the difficulties of the words (see definition of word difficulty) that had been brought into the surface structure from the deep structure of a sentence i.e., words that have resulted in the surface structure from the application of a transformation rule.

HYPOTHESES

Following are the main hypotheses tested in this study.

1. There is no significant relationship between presence of various

(Deep Structure)



(Shallow Structure)

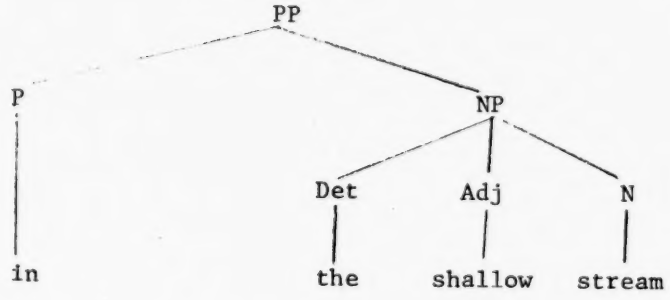


FIG. 1 DEEP AND SURFACE STRUCTURE REPRESENTATION OF THE APPLICATION OF THE ADJECTIVE TRANSFORMATION.

transformations and the difficulty of a sentence or written prose passage when difficulty is measured by the "cloze" technique.

2. There is no significant relationship between the difficulty of various transformations and the difficulty of a sentence or written prose passage when difficulty is measured by the "cloze" technique.

3. There is no significant relationship between the difficulty of sentences or of written prose passages and the number of transforms within these sentences or passages.

4. There is no significant difference in the difficulty of different transformations over grade, sex, mental ability, and reading achievement.

THE ANALYSIS OF BASAL READERS AND CONSTRUCTION OF STORIES

The three basal reading series chosen for investigation of language samples were The Ginn Basic Series, The New Basic Readers, and The Young Canada Readers (hereafter referred to as Series A, B, C, respectively). Each reader was divided into seven sections of approximately equal length and a prose passage of at least one hundred words was randomly selected from each section.

Each sentence of the selected passages was analysed by drawing a phrase-marker for it. By comparing the phrase-markers of the deep and surface structure it could be determined which transformations had been applied in the derivation of the sentences. The rules applicable, constituted the grammar and were typed in final form.*

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* See Appendix for examples of transformational rules.

The finalized grammar consisted of forty-three rules which were grouped into four major categories - Embedding, Conjoining, Deletion, and Simple. A fifth category Position Shift was added to account for a re-ordering of elements within the surface structure of the sentence, for example, the introductory adverbial phrase. Sentences in which it was not possible to measure the difficulty of transformations independently were termed multi-transformation units.

Two sets of stories were constructed for the study. The twenty-one passages referred to above will be designated as Part I of the study while the two sets of stories designed especially for the study will be designated as Parts II and III, respectively.

Stories Part II. From each of the three basal reader series, one passage of prose was randomly drawn. Using the transformation rules as a guide, each story was then rewritten in four different ways. Each of the four forms contained twenty transformations which could be divided into groups of twelve and eight. That is, twelve of the transformations were one of the four major types investigated - Embedding, Conjoining, Deletion, and Simple, whereas the remaining eight were made up of transformations from the other three categories. Vocabulary was controlled to a grade four level of difficulty.

Stories Part III. From each basal reader two more pages were randomly drawn. Five versions of each passage were constructed. The first version consisted of the passage exactly as it had been printed in the text and was termed the basic passage. To this passage, a sentence containing a transformation of the four major types was added separately.

DESIGN OF THE STUDY

Sample. The sample in this study consisted of 440 pupils, 220 boys and 220 girls, randomly selected from a population of the regular grade four, five and six classes in an Eastern Canadian city. The age range of the sample was nine to twelve years.

Test Instruments. The main testing instrument of this study was the "cloze" test which was constructed on the passages drawn randomly from grade four basal readers, and on stories designed especially for this study.

Mental ability was assessed by means of the Cooperative School and College Ability Test (SCAT) Level 5 Form 5A, while a comparison test, the Sequential Tests of Educational Progress (STEP), Level 4, Form 5A, was used as a measure of reading achievement.

Data were subjected to statistical analysis.

THE FINDINGS

The findings below have been condensed from four chapters of results and consequently it is possible to give only the main outcomes of the study.

Analysis of Sentence Samples from Basal Readers

Within the pages of the three basal readers analysed, the writer found a total of 1035 transformations which were grouped into four major categories - Embedding, Conjoining, Deletion, and Simple. A fifth category Position Shift was added. These categories were sub-divided into forty-three specific transformation rules.

Almost all of the sentences sampled contained transformations as defined by the grammar of this study. In Series A, ninety-four per cent of the sentences contained transformations, in Series B, ninety-six per cent of the sentences contained transformations, while the number of sentences in Series C containing transformations was ninety-eight. The number of transformations per sentence varied widely within and among series, and ranged from zero to twenty-seven transformations per sentence. The average number of transformations per sentence per series was Series A - 5.0, Series B - 4.5, and Series C - 6.5.

There was a high degree of similarity between the occurrence of the different types of transformations in each of the three Series.

(Insert Figure 2 about here)

Embedding and Simple transformations occurred frequently in all texts and in that order in Series A and C. Conjoining and Deletion transformations were present in greater numbers in Series C than in the other two series. A breakdown of the transformations in each of the various transformational categories showed more similarities than differences among the different reader series. The most frequent occurring transformation in each category was the same for all series.* However, there was some variation as to the percentage of the total number of transformations in each text which it represented.

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* Embedding - adjective; Deletion - common elements deletion; Simple - simple pronoun; Position Shift - adverb shift.

Relationships Between Transformations, Sentence and Passage Difficulty

The degree of understanding which a pupil derives from a printed passage may be affected by language structure in a number of ways. Both the presence of the structure, and its difficulty may be contributing factors to this difficulty.

The Relationship of the Presence of the Various Transformations to Sentence and Passage Difficulty

Written language was generally more difficult for pupils to understand when Embedding and Deletion transformations were present. Sentences were more difficult than were the passages which contained these transformations. Correlations between the presence of the Conjoining transformations and sentences and passage difficulty were significant for the total group but not for either of the grades separately. An analysis of the correlations between the various Simple transformations and sentence and passage difficulty showed that the majority of the significant correlations were positive. This means that the presence of these transformations usually indicated an easier sentence or passage for the pupils of this sample. It was also noted that many of the Simple transformation which positively correlated with sentence and passage difficulty are usually found in direct speech. Ruddell's study (1963) has shown that the more similar written language structures are to oral language structures of grade four pupils, the easier these written structures are likely to be for pupils to understand.

The "adverb replacement shift" (Position Shift Category) was generally negatively correlated with sentence and passage difficulty. This is really a two-fold transformation since the adverb clause was first embedded and then front shifted. The "that + S object quote shift" and the "NP - V

inversion" which were generally positive correlated with both sentence and passage difficulty are also frequently found in direct (oral) speech.

The Relationship of the Difficulty of Various Transformations to Sentence and Passage Difficulty

The difficulty of the majority of transformations within the various categories (except Deletion) correlated significantly with the difficulty of the sentence and passage in which they were found thus indicating that as the difficulty of the different transformations increased so did the difficulty of the sentence or passage. It appears that it is the presence of the Deletion transformation rather than the degree of the difficulty of these structures which causes pupils difficulty in comprehending what they read. The fact that there were more significant correlations between transformations and sentence difficulty than between transformation and passage difficulty was explained by the redundancy of the English language. That is, if a pupil fails to grasp a concept while he is reading, there is a much greater opportunity for him to acquire further information on this concept at a later point when he is reading a passage as opposed to when he is reading a sentence. For example, when a child reads "The bear overturned Betsy's sewing basket" the only information which the "adverb replacement deletion" in the following sentence "After that he walked around the room" gives is sequence in time, and in many stories of the basal readers, sequence in time is usually correlated with the linear position of sentences.

Difficulty of Transformations over Grade Levels

There was a remarkably high degree of similarity among the types of transformations that were most difficult across grade levels.

(Insert Figure 3 about here)

A rank order correlation showed relationships ranging from .77 to .86. It thus appears that the same types of transforms are causing difficulty at each grade level tested.

When an attempt was made to analyse transformations in terms of their difficulty, their presence, and the correlation of these factors with sentence and passage difficulty, there appeared to be little consistency. That is, some transformations influenced the difficulty of a sentence or passage more by its presence than by the difficulty of the words which resulted from the application of a particular transformation. However, an analysis showed that a sentence or passage which pupils found difficult to understand would be more likely to contain "appositives", "ing-nominalizations", and "pronoun (genetive)" of the Embedding group, the "common elements deletion" of the Deletion category and the "negative" from the Simple category of transformations. Conjoining transformations and transformations generally occurring in direct speech (regardless of the category to which they belonged) would tend to indicate an easy passage from the point of view of pupils' understanding of what they read.

The Number of Transformations and Sentence Difficulty

Since studies have shown that the number of words per sentence is an important factor in the difficulty of a sentence, it was decided to control for the number of words when an analysis was made between the number of transformations and the difficulty of the sentence in which they occurred. Results showed that the number of transformations per sentence are not good indicators of sentence difficulty - either for the total group or for any of the sub-groups. This finding would tend to refute the opinion that there

is a psychological reality corresponding to the number of transformations per sentence and sentence difficulty when sentence difficulty is measured by the "cloze" technique.

When the difficulty of stories with equal numbers of transforms was investigated (Part II), results showed that stories with a greater number of Deletion type transforms were consistently difficult for students at each grade level tested. Passages containing a greater number of Conjoining type transforms were easiest for children at the intermediate grade levels.

Stories with a single transform added (Part III) did not differ significantly over grade levels. Differences for two stories approached significance ($p \approx .07$). In each case the transform added was a "relative clause" of the Embedding type. Previous data have shown that the presence of this transform correlates significantly with sentence and passage difficulty.

Stories with transformational structures added in the middle of the story were more difficult than stories with such structures added at the beginning or end.

Transformation Difficulty and Selected Variables

When an analysis was made of the differences between the difficulty of each of the transformations by grade, sex, reading achievement and mental ability, it was found that more significant differences occurred when students were grouped by sex than by either of the other factors. The next highest number of significant differences on transform difficulties occurred for students grouped by reading achievement. It appears that the higher

reading achievers have an advantage over lower reading achievers in their comprehension of transformations within written language. Fewest differences occurred when pupils were grouped on the basis of mental ability. Transformation difficulty tended to decrease from grade four to grade six. Most differences among grades, however, were accounted for by the variation between the performance of grade four and five, and grade four and six pupils.

Results Incidental to the Main Purpose of the Study

In the course of analysing the main results of the study, a number of other findings were evident. These related mainly to pupil's facility with language structures in the sense that a number of individuals inserted words which changed the grammatical structures of the sentence but such structures were still grammatically acceptable within the context of the passage. This type of behaviour tended to be more characteristic of girls rather than of boys and of grade six pupils rather than grade four pupils.

Pupils also frequently ignored punctuation marks and consequently often obtained the incorrect meaning of which they were reading.

IMPLICATIONS

The results of this study provided new insights into the nature of the complexity of written language from the point of view of the transformational-generative model of grammar. Information on the nature of language structure complexity appearing in three grade four basal readers

was given. The results should also provided added information on the readability of written material and should provide a new dimension to the process of understanding what is read.

More specific implications are given below.

Results of this study have shown that pupils at the grades four, five and six levels do not comprehend fully the various written language structures. Teachers may incorporate into their teaching of comprehension skills in the developmental reading program a section on the forms of language structure. In view of the findings of this study, it appears that the teaching of language structure as an aid to comprehension would be most effective when taught from a transformational point of view. The base structure of a sentence may be taken as an illustration and with the aid of tree markers, the teacher could demonstrate how various syntactic patterns of the language (adjective, relative clauses, etc) are related according to this theory. Pupils too may engage in this activity.

Cloze tests may be used to get an indication of a child's facility with written language structure. Cloze procedures may also be used to help students note clues indicating the presence of particular language elements.

Examples of good as well as deviant sentence structures may be taken from the students' own written assignments and the merit of the well structured sentences and the improvement of the poorly structured ones discussed. Pupils should understand why the latter were not considered well structured sentences.

There has been some evidence in the findings of this study to show that the position of certain structures may be important for comprehension

purposes. In view of this there may be some discussion on the importance of the topic sentence, its position in the paragraph where students think it would be most effective, and the appropriateness of certain linguistic patterns for conveying the idea it contains.

Pupils who have written on a particular topic may be asked to 1) tell about it, 2) read it. These situations may be taped. With the teacher's aid students may discuss the differences in these two forms of language and compare them with written language of the paragraph.

Structures unique to a dialect or a geographical area may be discussed. Slang expressions are particularly appropriate for such an exercise. These expressions usually contain a number of deletions. Structural changes where linguistic forms have taken on other grammatical functions may be discussed such as the verb "researched" from the noun "research", or "wreckwood" from the wood of wrecks being sold as souvenirs in Eastern Canada.

Pupils should be made aware of the redundancy of language structure. Pupils may be given practice in eliminating all information in a passage except the "core". They may be asked to decide what information may be omitted entirely without destroying the context of the passage. Students may also be asked to list all the clues concerning a particular linguistic element named by the teacher. For example, the teacher may ask for all clues to the plurality of "huskies" in the sentence, "The two huskies were the best friends old Ootik ever had".

Methods courses on the teaching of reading should put greater emphasis on the place of written language in comprehension. Practice with

some of the exercises for the teaching of structure as suggested in the preceding implications would be valuable in such courses.

The field of linguistics is constantly providing new ideas in the field of language. New theories on the structure of language are being constructed and old theories modified. In order that teachers keep up-to-date on new ideas in the field of language they should be encouraged to take linguistic courses as part of their teacher education program.

SUGGESTIONS FOR FURTHER RESEARCH

1. This study could be replicated at other age and grade levels.

2. Passages containing those transformations which pupils found difficult in this study could be used to determine whether these transformations tend to increase the difficulty of a passage when the passage is presented orally.

3. More information is needed on the degree to which students make use of punctuation marks when they read and on the importance of such features for reading comprehension. Comparative studies between a pupil's use of pitch, stress, and juncture would provide valuable information.

4. Would students be better able to comprehend written language if they were taught how to analyse structures which tend to make written language difficult ? This area is in need of further investigation.

5. The difficulty of a passage is not the sum of the difficulties of the sentences. It was suggested that this was due to the redundancies of the language. What are these redundancies and how can pupils make best use of them in comprehending what they read ? Both questions are in need of further research.

6. Does the application of certain transformations somehow help a reader "chunk" the surface level of a sentence and thus facilitate the processing of written language ?

7. An in depth study of those individuals who tend to manipulate very easily (interchange) syntactic patterns, would provide more information on children's facility with language and possibly more information on language development.

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APPENDIX

EXAMPLES OF GRAMMATICAL RULES OF THE STUDY

EMBEDDING

Noun Expansion :

1. Relative Clause : Example : I admire my English teacher who is a scholar.

Noun Replacement :

1. That + S as object : Example : I believe that he has made the team.

Verb Expansion :

1. Verb + C : Example : After a crash they always make pilots fly again.

Adverbial Replacement :

1. Adverbial replacement in location, time, manner, cause : Example : You may go whenever you wish.

CONJOINING

1. Example : The boat sank but nobody drowned.

DELETION

1. WH Deletion : Example : He has a book he wants to show you.
2. Common Elements Deletion (from conjoining) : Example : his room seemed lonely and damp.

SIMPLE

1. Passive : Example : The boy hit the ball - The ball was hit by the boy.

2. Negation : Example : He did not see the mirage on the desert.

POSITION SHIFT

1. NP-V Inversion : Example : "That's right", said Randy.

Fig. 2. PERCENTAGE OF OCCURRENCE OF TRANSFORMATION TYPES WITHIN THE THREE BASAL READER SERIES

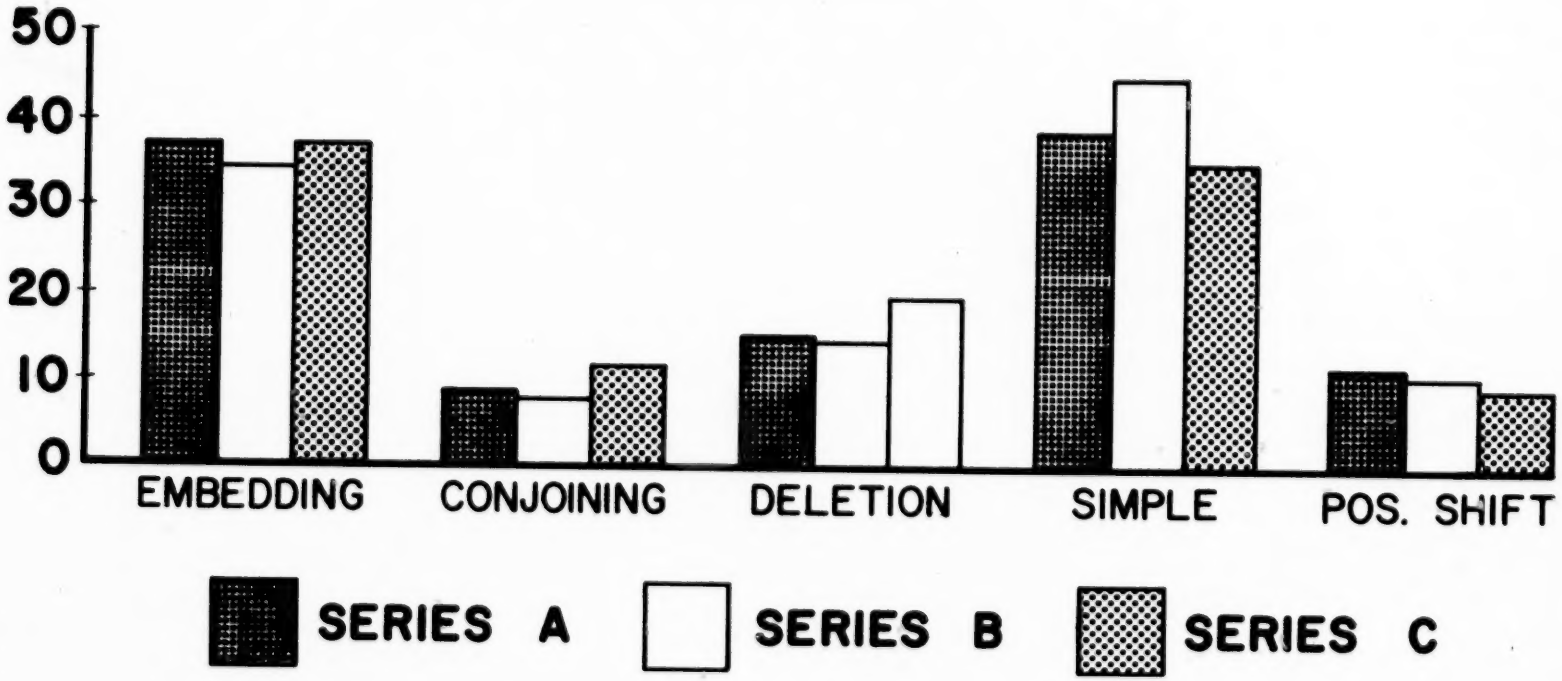

Fig. 3. DIFFICULTIES OF THE DIFFERENT TYPES OF TRANSFORMS BY GRADE.